

REMARKS

Claims 1 and 3-14 are pending.

1. The Office Action rejects claims 1 and 3-14 under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 5,702,971 to Stevens in view of U.S. Patent No. 5,972,804 to Tobin et al. and U.S. Patent No. 6,127,234 to Gardner et al. and optionally in view of U.S. Patent No. 4,593,303 to Dyck. If applicable to the present claims, this rejection is respectfully traversed.

Stevens does not disclose, teach or suggest all of the limitations specified in the present claims. For example, Stevens does not disclose, teach or suggest a method

characterized in that ... the photo-charge generating channel-shaped semiconductor regions are not formed in the silicon slice until after the gate dielectric has been provided on the surface of the silicon slice, all of the ions of the dopants of a polarity type defining the photo-charge generating channel-shaped semiconductor regions being implanted through the gate dielectric and the photo-charge generating channel-shaped semiconductor regions are formed in the silicon slice before the strip-shaped electrodes are formed on the gate dielectric

as specified in claim 1, and therefore contained in all claims dependent thereon.

In particular, Stevens does not disclose "all of the ions of the dopants of a polarity type defining the photo-charge generating channel-shaped semiconductor regions being implanted through the gate dielectric" as specified in present claim 1. The Office Action suggests that the buried channels 35 of Stevens reads on the channel-shaped semiconductor regions specified in present claim 1. Note that buried channels 35 of Stevens includes the superposition of layer 16 (FIG. 1 of Stevens) and the implant depicted in FIG. 2 of Stevens. Stevens cannot be read as disclosing that "all of the ions of the dopants of a polarity type defining the channel-shaped semiconductor regions [are] implanted through the gate dielectric" at least because buried channel 35 of Stevens is comprised of the superposition of region 16 (depicted in FIG. 1 of Stevens) and the implant depicted in FIG. 2 of Stevens. Stevens discloses only that some "of the

ions of the dopants of a polarity type defining the channel-shaped semiconductor regions [are] implanted through the gate dielectric” as depicted in Stevens, FIG. 2. However, the rest “of the ions of the dopants of a polarity type defining the channel-shaped semiconductor regions” were already present as region 16 prior to the implant depicted in FIG. 2 of Stevens. Stevens even specifies in claim 1 that the formation by implant of an n type region 16 in p type substrate 12 is a first step (see FIG. 1 and the “providing” step of Stevens’ claim 1), and the formation of a gate dielectric 14 as depicted in FIG. 4 (which is sometimes called oxide layer 13) is a second step (see FIG. 1 and the “placing” step of Stevens’ claim 1).

The Office Action dismisses the “all of the ions ...” claim limitation specified in present claim 1 by asserting that the anti-blooming drain implant described in Stevens (i.e., implant region 16, FIG. 1) is a preferably structure and not a necessary structure. This assertion is respectfully traversed. The title of Stevens specifies a self-aligned lateral overflow drain (LOD). Claim 1 of Stevens specifies “providing a semiconductor substrate of a first conductivity type, having an antiblooming channel implant of a second conductivity type.” This anti-blooming structure is also featured in the Abstract, FIG. 1, the Background of the Invention, Summary of the Invention, Advantageous Effect of the Invention, Brief Description of the Drawings and the Detailed Description of the Invention. Clearly, the anti-blooming structure cannot be dismissed from Stevens as merely a preferable structure.

The prior art must be considered as a whole. The M.P.E.P. at 2141 instructs “[w]hen applying 35 U.S.C. 103, the following tenets of patent law must be adhered to: (A) The claimed invention must be considered as a whole; (B) The references must be considered as a whole and must suggest the desirability and thus the obviousness of making the combination; (C) The references must be viewed without the benefit of impermissible hindsight vision afforded by the claimed invention;” citing *Hodosh v. Block Drug Co., Inc.*, 786 F.2d 1136, 1143 n.5, 229 USPQ 182, 187 n.5 (Fed. Cir. 1986).

Again, the M.P.E.P., at 2141.02, instructs “[a]scertaining the differences between the prior art and the claims at issue requires interpreting the claim language, and considering both the invention and the prior art references as a whole. See MPEP § 2111 - § 2116.01 for case law

pertaining to claim interpretation” (emphasis added). And then in the M.P.E.P. 2141.02 section on “Prior Art Must Be Considered In Its Entirety, Including Disclosures That Teach Away From The Claims” the M.P.E.P. further instructs that “[a] prior art reference must be considered in its entirety, i.e., as a whole, including portions that would lead away from the claimed invention. *W.L. Gore & Associates, Inc. v. Garlock, Inc.*, 721 F.2d 1540, 220 USPQ 303 (Fed. Cir. 1983), *cert. denied*, 469 U.S. 851 (1984) (Claims were directed to a process of producing a porous article by expanding shaped, unsintered, highly crystalline poly(tetrafluoroethylene) (PTFE) by stretching said PTFE at a 10% per second rate to more than five times the original length. The prior art teachings with regard to unsintered PTFE indicated the material does not respond to conventional plastics processing, and the material should be stretched slowly. A reference teaching rapid stretching of conventional plastic polypropylene with reduced crystallinity combined with a reference teaching stretching unsintered PTFE would not suggest rapid stretching of highly crystalline PTFE, in light of the disclosures in the art that teach away from the invention, i.e., that the conventional polypropylene should have reduced crystallinity before stretching, and that PTFE should be stretched slowly.)”

It cannot be seriously contended that Stevens discloses implanting “all of the ions of the dopants of a polarity type defining the photo-charge generating channel-shaped semiconductor regions ... through the gate dielectric.”

The Office Action appears to have mischaracterized the method of making the lateral overflow drain (LOD) of Stevens as disclosing a subordinately disfavored embodiment (i.e., a teaching away) that omits the LOD (i.e., without the formation of layer 16 depicted in FIG. 1 of Stevens). The Office Action cites several cases and asserts that the cited cases support the elimination of the formation of the lateral overflow drain (LOD) of Stevens. This assertion is respectfully traversed. The cited cases generally address a reference that discloses a preferred structure or compound and a disfavored structure or compound, and the Office Action asserts that cases hold that the mere fact that a structure is disfavored does not render it inapplicable as a prior art structure for anticipation analysis. For example, the Office Action cites Celeritas Technologies Ltd. v. Rockwell International Corp., 150 F.3d 1354, 1361, 47 USPQ2d 1516,

1521-22 (Fed. Cir. 1998). In Celeritas, the court stated that “[a] reference is no less anticipatory if, after disclosing the invention, the reference then disparages it. Thus, the question of whether a reference ‘teaches away’ from the invention is inapplicable to an anticipation analysis.” Celeritas Technologies Ltd. v. Rockwell International Corp., 47 USPQ2d at 1522. Note that this is an anticipation analysis, not an obviousness analysis.

Contrary to the assertion of the Office Action that the LOD is merely a preferred embodiment, the LOD is the invention of Stevens. The formation of layer 16 of Stevens is essential to the disclosed LOD. The Office Action provides no evidence to support any factual finding that one can pick and choose some of the steps of the method while ignoring other steps of the method. For at least the reasons discussed above, the references must be considered as a whole. Selectively choosing to ignore the formation of layer 16 does not consider the references as a whole.

Even if, the Office Action were to be read as suggesting that the method of Stevens could be modified to eliminate the formation of layer 16, i.e. the first step specified in Steven’s claim 1, so as to render the present claim 1 obvious, the Office Action provides no evidence suggesting the desirability of the modification. Modification of a method disclosed in a reference to render a claim obvious requires that there exist a prior art disclosure of a motivation to make the modification. “The mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination. *In re Mills*, 916 F.2d 680, 16 USPQ2d 1430 (Fed. Cir. 1990).” See M.P.E.P., section 2143.01, page 2100-98, Rev. 1, Feb. 2000, 7th Ed (emphasis in the original).

Not only has the Office Action cited no reference disclosing a motivation to modify Stevens, Stevens itself teaches that omission of the anti-blooming implant (layer 16) would render the Stevens device unsatisfactory for its intended purpose. “If proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification. *In re Gordon*, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984).” See M.P.E.P., section 2143.01, page 2100-99, Rev. 1, Feb. 2000, 7th Ed. Without anti-blooming regions 22 and 32 (formed from region 16), the device

of Stevens would not work for its intended purpose as described in Stevens at column 2, lines 64 through column 3, line 9. As Stevens explains in detail, the “uniform, n-type, antiblooming channel implant 16 as shown, along with the gate dielectric 14 thickness and substrate doping, sets the channel potential of this region” (see column 3, lines 50-53 and column 4, lines 3-6). This feature, among others, makes Stevens device “insensitive to drain bias” (see column 3, line 67) which is listed among the advantages of the device.

U.S. Patent No. 5,972,804 to Tobin et al. discloses a transistor with transistor gate dielectrics and does not disclose a photo-charge generating channel-shaped semiconductor region at all. In particular, Tobin et al. does not disclose that a channel-shaped semiconductor region is formed after a gate dielectric as specified in claim 1.

U.S. Patent No. 6,127,234 to Gardner et al. discloses a transistor with a transistor gate dielectric and does not disclose a photo-charge generating channel-shaped semiconductor region at all. In particular Gardner et al. does not disclose that a channel-shaped semiconductor region is formed after a gate dielectric as specified in claim 1.

U.S. Patent No. 4,593,303 to Dyck et al. does not disclose a photo-charge generating channel-shaped semiconductor region formed after a gate dielectric is formed and stripped shaped electrodes formed substantially parallel to the channel-shaped semiconductor region as specified in claim 1.

Accordingly, withdrawal of the rejection of claim 1, and each claim dependent thereon, is earnestly solicited.

Similarly, Stevens does not disclose, teach or suggest a method

forming a plurality of elongate photo-charge generating channels in the silicon slice by implanting all of the dopant ions of a polarity type defining the photo-charge generating channels through the gate dielectric into the silicon slice, the photo-charge generating channels being formed so as to adjoin the surface

as specified in claim 4, and therefore contained in all claims dependent thereon.

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For at least the reasons discussed above with respect to claim 1, Stevens, Tobin et al., Gardner et al. and Dyck et al. do not disclose implanting "all of the ions of the dopants of a polarity type defining the photo-charge generating channel-shaped semiconductor regions through the gate dielectric" as specified in claim 4.

Accordingly, withdrawal of the rejection of claim 4, and each claim dependent thereon, is earnestly solicited.

CONCLUSION

In view of the present amendments and remarks, withdrawal of the rejection of the claims is earnestly solicited. The combination of features has important and surprising advantages. It is respectfully submitted that the present application is in condition for allowance. Prompt reconsideration and allowance of the application are earnestly solicited. Should the examiner believe that any further action is necessary to place the application in condition for allowance, the examiner is invited to contact the undersigned applicant representative at the telephone number listed below.


The Commissioner is hereby authorized to charge any fees (or credit any overpayment) associated with this communication to Deposit Account No. 13-3402

Respectfully submitted,

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